1. a 200 g and 250 g mass connected over a pulley. Determine the acceleration and tension in the strings when you let them go.

a) hang freely
Atwood Machine

if massless string + Pulley + frictionless $F_{T_1} = -F_{T_2}$

Whole system

$F_{net} = \Sigma F = F_{g_1} - F_{g_2}$ ~~$+F_{T_2} - F_{T_1}$~~

$F_{net} = ma$ $\quad m_1 g - m_2 g$

$(m_1 + m_2)a = F_{g_1} - F_{g_2}$

$(m_1 + m_2)a = (m_1 - m_2)g$

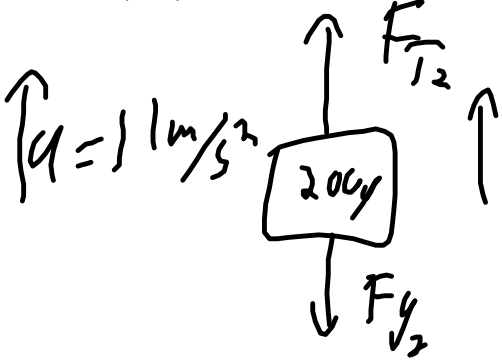
$$a = \frac{(m_1 - m_2)}{(m_1 + m_2)} g$$

$$a = \frac{(0.25\,kg - 0.20\,kg)}{(0.25\,kg + 0.20\,kg)} \; 9.81 \frac{N}{kg} = 1.1\,m/s^2$$

s=1.0m t=1.4s a=? u=0
$s=1/2at^2 + ut$
$a=2s/t^2 = 2(1.0m)/(1.4s)^2$
$2x1/(1.4x1.4)=1.0204 = 1.0\ m/s^2$
reduced by the mass of the scales (probably) and the mass of the pulley and friction possibly.

the mass of the pulley and friction possibly.

Part



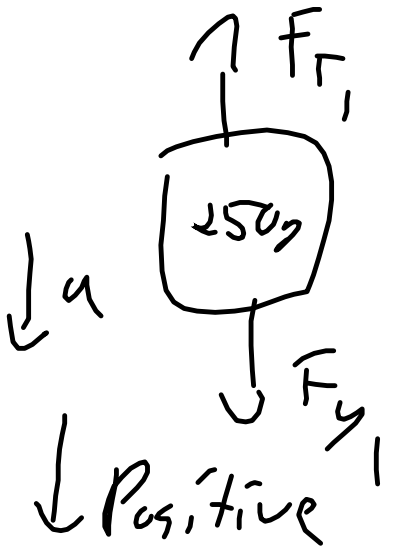
$F_{net} = ma = \sum F$

↑ Positive $m_2 a = F_{T_2} - F_{g_2}$

$F_{T_2} = m_2 a + m_2 g$

$F_{T_2} = 0.20\text{kg}(1\text{ m/s}^2 + 9.81\text{ m/s}^2)$

$F_{T_2} = \boxed{2.2\text{N}}$



directions

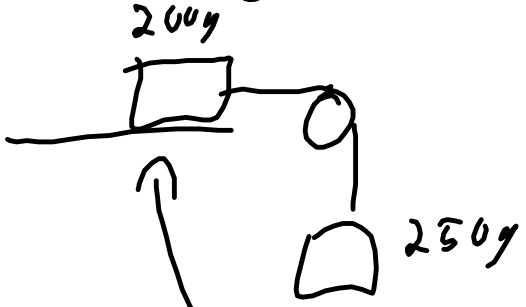
$m_1 a = F_{g_1} - F_{T_1}$

$F_{T_1} = F_{g_1} - m_1 a$

$F_{T_1} = 0.25\text{kg}(9.8\text{ m/s}^2 - 1.1\text{ m/s}^2)$

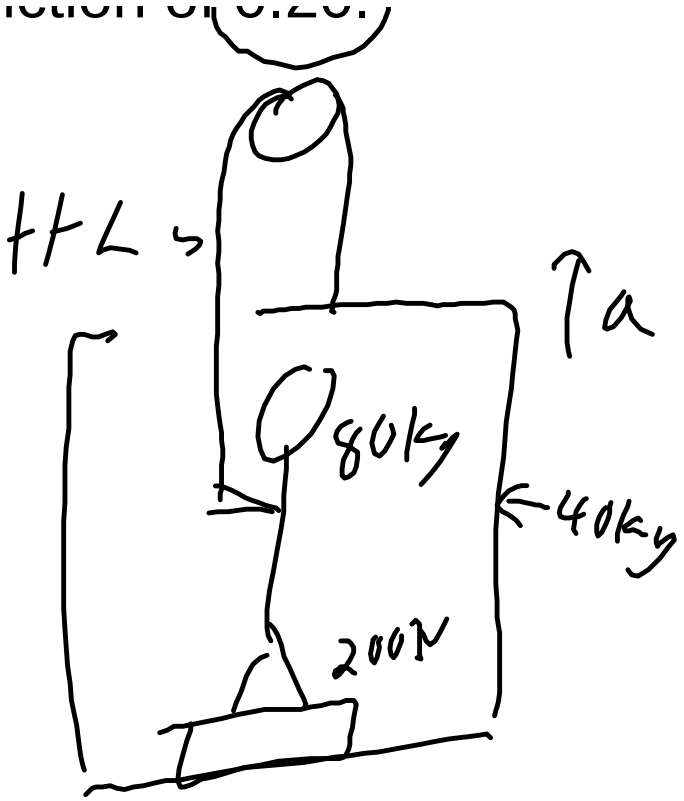
$= \boxed{2.2\text{N}}$

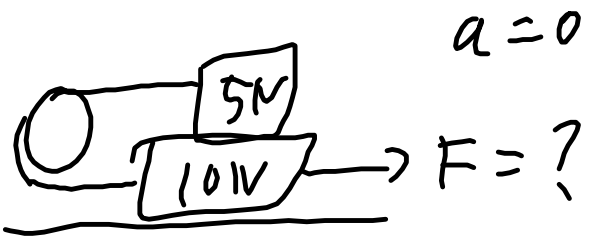
b) the 200 g mass is on a frictionless table



c) the 200g mass is on a table with coefficient of friction of 0.20.

friction of 0.20.

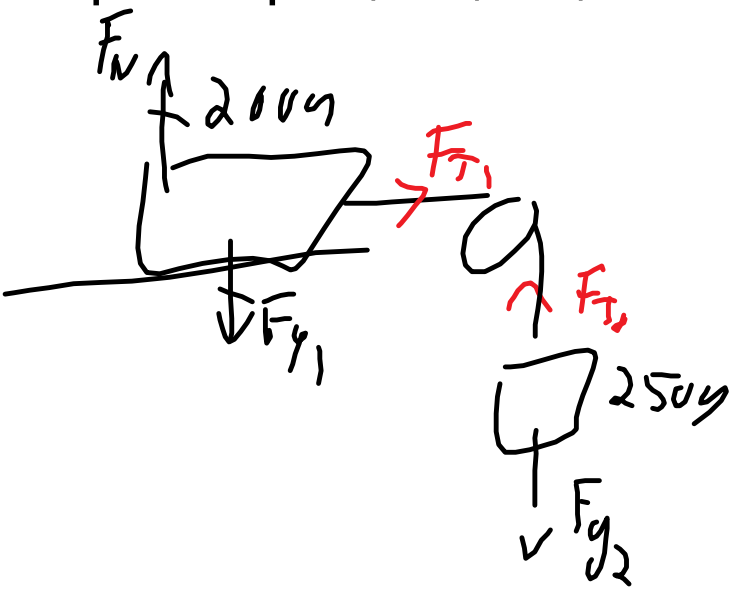




a = 0

$\mu = 0.50$

Chapter 5 practice problems
p107 q 20, 23, 26, 28



$F_{net} = F_{g_2} = m_T a$

($m_2 g$ ↓, $m_1 + m_2$ ↓)

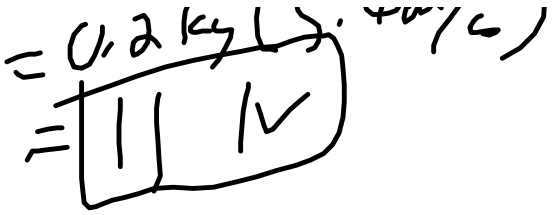
$a = \frac{m_2 g}{m_1 + m_2}$

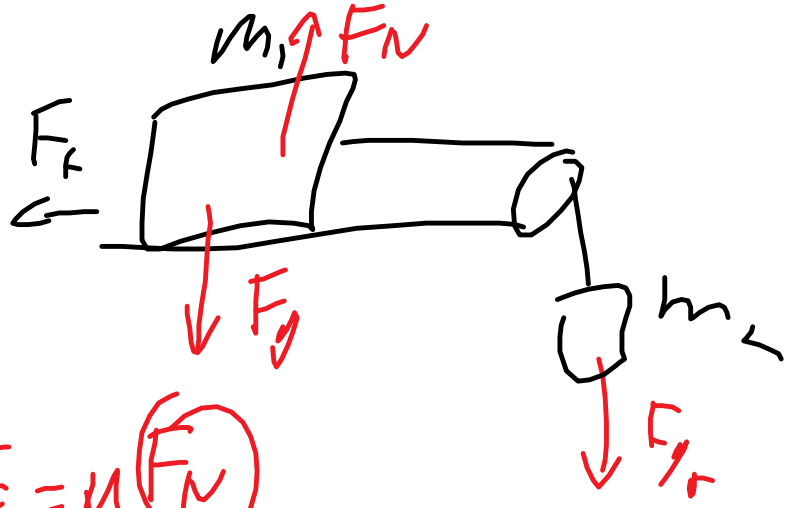
$a = \frac{0.25(9.81)}{0.\cancel{65}}$

$a = 5.\cancel{4}\ m/s^2$

$F_{T_1} = m_1 a$

$= 0.2\ kg(5.4\ m/s)$





$F_{net} = F_{g_2} - F_f = m_t a$

$F_f = \mu F_N$

$m_2 g - \mu m_1 g = (m_1 + m_2) a$

$$a = \frac{0.25(9.8) - 0.2(0.2)98}{0.2 + 0.25}$$

$$a = 4.6 \text{ m/s}^2$$

$m_1 a = F_{T_1} - F_f$

$F_{T_1} = m_1 a + F_f$

$= 0.2(4.6) + \mu_k (0.2)(9.8)$

$F_T = 13 \text{ N}$

$$F_{T_1} = 1.3\,N$$